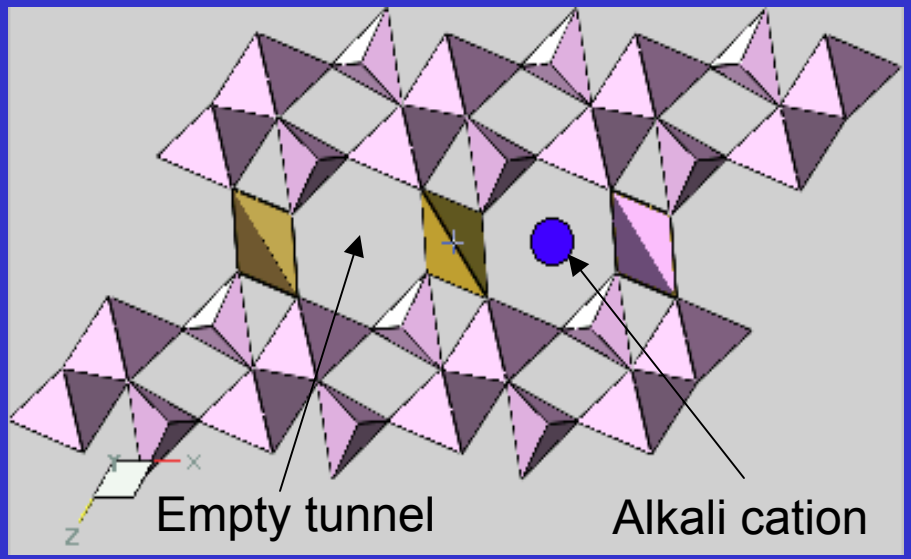
Ion Transport in Beta-Gallia Rutile Intergrowths

Doreen Edwards, Alfred University, DMR-0093690

Materials used for energy storage and production systems often possess guest-host architectures that enable guest cations to be inserted and transported in pathways present in the host structure. We are investigating a series of materials known as beta-gallia rutile intergrowths. These materials possess hexagonally-shaped one-dimensional tunnels that provide pathways for transporting small-to-medium sized cations like lithium, sodium, and potassium. The graphic on the right shows a crystal structure model of one of the intergrowths and how its lattice energy changes with inclusion of different types of cations.

$A_{0.7}Ga_{4.7}Ti_{0.3}O_8$

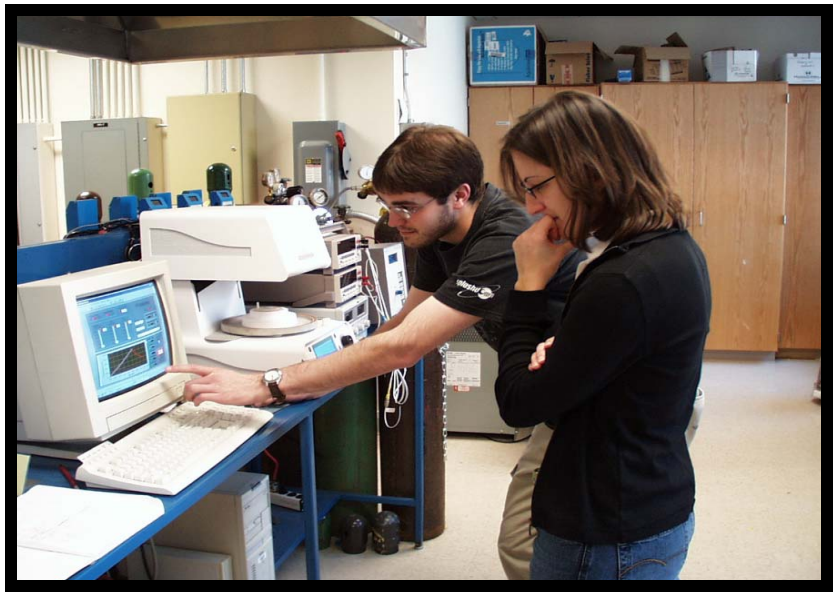


Alkali Cation	Calculated Lattice Energy (eV)
A = Li	-396.8
A = Na	-395.5
A = K	-393.8

Ion Transport in Beta-Gallia Rutile Intergrowths

Doreen Edwards, Alfred University, DMR-0093690

Education and Outreach: Two undergraduates (Stephanie DuClair and Laura Mirabito) and three graduate students (Andrea Jaromin, Nathan Empie, and Malin Charoenwongsa) contributed to this work. Empie was initially supported by this grant, but recently received a National Defense Science and Engineering Graduate Fellowship. Charoen-wongsa is supported by the Thai government and will complete her Ph.D. early next year.



Above: Undergraduate Laura Mirabito and graduate student Andrea Jaromin are showing the PI some of their X-ray diffraction results.

Left: Graduate student Nathan Empie is showing undergraduate Laura Mirabito how to operate one of the electrical-measurement systems developed for this project.